Testimony of Jason Peltier
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"Conjunctive Water Management: A Solution to the West's Growing Water Demand?"
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Mr. Chairman and Members of the Committee, it is a pleasure to appear today to discuss conjunctive water management.

Conjunctive water management is increasingly being utilized by local water providers throughout the West as they come to the realization that in many locations, there simply is not enough surface water or ground water available, at the right times, to meet water demands. Given the growing and changing demand for water and given that non-structural solutions usually follow structural (i.e., reservoirs), non-structural solutions such as conjunctive water management can improve the efficiency and effectiveness of water delivery systems and are important contemporary issues in the West.

In the mid-twentieth century, farmers and water managers from the Great Plains to Phoenix to California's Central Valley developed an increasingly-heavy dependence on ground water to meet their needs. In locations not served by large surface water storage projects, this was often their only source of water. However, continued pumping over the years has drawn down water tables in some areas, pumping has become more costly, and ground subsidence has been observed. As local water users and providers have witnessed decline of their ground water sources, they have expanded their water portfolios to jointly manage and use ground water and surface water.

Conjunctive water management is therefore a state- and locally-driven endeavor. Under western water law, states exercise jurisdiction and control over their ground water and surface water resources. The Federal government has a long and proud history of creating surface water storage to assist local entities in capturing water for beneficial uses. Bureau of Reclamation projects have generally provided surface water that can be managed jointly with ground water, while the US Geological Survey has conducted research to develop an understanding of surface water and ground water systems and their interaction.

BUREAU OF RECLAMATION

Participation of the Federal government in conjunctive water management projects is on a case-by-case basis, often in relation to preexisting Federal projects. Following are examples of the Bureau of Reclamation's involvement in conjunctive management in each of its five regions.

Central Valley, California
In recent years, banking surplus surface water supplies in ground water aquifers has become a widespread type of conjunctive use of water, referred to generally as "water banking." A number of Central Valley Project (CVP) contractors have entered into long term agreements with the operators of water banking projects, primarily in Kern County, where conditions for ground water storage tend to be good.

Kern Tulare and Rag Gulch Water Districts are CVP contractors who get delivery of their CVP water through the Cross Valley Canal. In the past several years, deliveries to their customers have been limited, resulting in supply shortages in dry years. In response, these districts have entered into long term water banking arrangements with Kern County districts. This provides the ability to store surplus water when it is available, providing water supply reliability in dry years.

Phoenix, Arizona
The Salt River Project (SRP) stores surface water from the Salt and Verde Rivers in reservoirs, and also has rights to pump ground water. Both supplies are used routinely to meet area demands for water. In drought years, ground water supplies are used extensively; in wet years, surface water is relied on more extensively and used to recharge the aquifer for future use.

The Central Arizona Project (CAP) brings Colorado River water into central Arizona, storing water in a regulating reservoir on the Agua Fria River. Originally, there was no conjunctive use envisioned within the CAP because it included no ground water supplies. It was envisioned that agriculture would be able to utilize all of the CAP water in early years of the project. However, due to the high cost of CAP water and the agricultural economy, CAP water in excess of demands for direct use is now recharged and stored underground for future use in time of declared shortages on the Colorado River. The Arizona Banking Authority was developed to ensure that Arizona's entire allocation could be utilized by storing any excess CAP water in ground water banks for future use.

In Phoenix, as in many other cases, Federal involvement is limited to supplying surface water through Federal facilities, with the water districts or individual users managing the ground water.

Wichita, Kansas
The Equus Beds Aquifer has supplied water to the City of Wichita, Kansas since the 1940s. Water tables have declined up to 40 feet in the area of the City's well field. In 1998, the State of Kansas issued the City a conjunctive use water rights permit that replaced and combined two previous City permits, one for Reclamation's Wichita Project, the other for the Equus Beds Aquifer. By combining the permits for these two resources into a single, integrated operation, the City can more effectively and economically deliver water to its customers. The resulting change in ground water use will reduce the stress on the aquifer and allow for increased aquifer recharge.

In addition, the City and Reclamation began planning studies and environmental analyses of an Equus Beds recharge demonstration project in the mid 1990s. The City plans to implement the project and is seeking legislation to amend the Wichita Project authorization (P.L. 86-787, September 14, 1960) to incorporate the Equus Beds as a division of the existing project. Reclamation has testified that the project is well conceived and planned, but that given

Reclamation's tight budget, we are not in a position to support the addition of this project to the long list of projects waiting for Federal funding. This project is similar to many conjunctive use projects in that it would produce significant, but purely local, benefits. Local communities may in many cases wish to pursue conjunctive use projects and Reclamation wants to encourage them to do so, but we believe that Federal money must be targeted towards issues where there are Federal responsibilities.

Quincy, Washington
The Quincy Ground Water Subarea is a ground water area designated under Washington State law and jointly managed by Reclamation and the Washington State Department of Ecology (Ecology). Its ground water "mound" was formed as surface and subsurface flows were contained by O'Sullivan Dam, part of Reclamation's Columbia Basin Project. A portion of the artificially stored ground water was made available for use in 1973, when Reclamation was granted a declaration of claim to the ground water located within the Subarea. Under the resulting program, users may pump Federal ground water for irrigation and municipal and industrial purposes after acquiring a well permit from Ecology and a ground water license from Reclamation that stipulates requirements and parameters for using this water. The program has allowed re-use of project water supplies not originally contemplated when the project was constructed and ensures that users of this water do not interfere with existing and future project needs.

Albuquerque, New Mexico
Historically, the City of Albuquerque relied exclusively on ground water to meet its potable and non-potable municipal water needs. The result has been unsustainable mining of its aquifer. The City has partnered with the Reclamation since 1996 to begin using San Juan-Chama Project surface water and promote sustainable, conjunctive water management. The Albuquerque Metropolitan Area Water Reclamation and Reuse Project fosters conjunctive surface water and ground water use by reusing industrial and municipal effluent and reclaiming naturally impaired surface water and ground water to meet non-potable needs. Once complete, this project will provide up to 6,000 acre-feet per year of recycled surface and ground water to meet irrigation and industrial uses.

U.S. GEOLOGICAL SURVEY

We are pleased to work with our partners in programs like those I just mentioned. In addition to the Bureau of Reclamation's assistance in supplying water, the U.S. Geological Survey provides support to State and local agencies contemplating or using conjunctive water management by providing:

1) hydrologic data for planning of conjunctive water management systems,

2) hydrologic modeling techniques suitable for planning and designing of conjunctive management systems,

3) application of models to specific regional systems to evaluate the potential application of conjunctive management, and

4) hydrologic data that are needed by the operators of these systems to provide continuing feedback on the effectiveness of the systems so that operations can be improved over time.

Most of the USGS efforts are conducted through the USGS Cooperative Water Program on a cost-shared basis with State, local, or tribal governments. Some of the fundamental research and development of simulation models is conducted through the USGS Ground Water Resources Program and USGS Hydrologic Research and Development Program. All of the research and modeling software developed by the USGS is freely available from USGS publications and web sites.

The design of conjunctive water-management systems requires a basic understanding of the water-budget components and hydrologic processes within a watershed. Monitoring of streamflows, ground-water levels, and other hydrologic variables provides information on the availability of water within a watershed, as well as the interaction of ground-water and surface-water systems. Water-use data also are needed to track changes in the supply and demand of ground- and surface-water resources over time. These are all parts of the USGS contribution to advancing the scientific underpinnings of conjunctive management.

Many conjunctive-use systems involve artificial recharge of surface water (whether potable, reclaimed, or waste-stream discharge) into the subsurface for purposes of augmenting or restoring the quantity of water stored in developed aquifers. Several different approaches for artificial recharge are used, and the USGS has provided monitoring and analysis in support of improved understanding of the physical, chemical, and microbiological factors that affect the operation and success of artificial-recharge projects. Some of the methods of artificial recharge in which the USGS has provided scientific monitoring and analysis are:

- Artificial-recharge basins and(or) recharge wells to store excess surface water in aquifers during high streamflow periods for later use during peak water-demand cycles (Antelope Valley, southern California; Wichita, Kansas). The potential benefits of storing surplus surface water by artificial recharge include a more stable source of water supply.
- An instream ground-water recharge facility along Rillito Creek in Tucson, Arizona.
- Bank-filtration projects along the Platte River, near Lincoln, Nebraska, and along the Great Miami River near Cincinnati, Ohio. Bank filtration is the process in which ground-water supply wells located next to surface-water bodies draw some of their discharge from the surface-water source through the river-bank material and into the well. The process has been used to remove potential contaminants from surface water, and can be thought of as pretreating the water.

During the past several decades, computer simulation models have played an increasing role in the analysis of conjunctive-management systems, and the USGS has been in the forefront in model development and real-world applications. On the model-development side, the USGS has developed computer models for both ground-water and surface-water analyses, and is currently working to directly couple two of its most widely-used ground-water and surface-water models into a single, comprehensive modeling tool. The resulting computer model, which is being field tested on data from Sagehen Creek Basin on the eastern slope of the Sierra Nevada range of California, will be applicable to the evaluation of conjunctive-management projects in

hydrologically complex, large-scale watersheds. In collaboration with university researchers, the USGS has also recently released a ground-water management computer program that can be applied to the design and evaluation of many types of conjunctive-management issues, such as determining optimal ground-water pumping strategies that limit instream-flow reductions.

The USGS has worked collaboratively with many western State and local agencies in the development and application of computer models for analysis of conjunctive-management projects. Recently, the USGS worked with the City of Albuquerque in the development and application of a conjunctive-management computer model for the ground-water and surface-water resources of the Albuquerque area for the project described previously in which the Bureau of Reclamation is also participating. The computer model helped determine the effects of ground-water pumping on streamflow leakage from the Rio Grande and storage depletions within the aquifers. The goal of the management model was to determine optimal ground-water withdrawal strategies to achieve particular objectives with respect to the river-aquifer system, such as limiting total leakage of river water to the aquifer.

It is clear that effective water-resources management will require that surface-water and ground-water resources be viewed as a single resource, and that the reliable yield of a system that includes both surface and ground water, when managed together, can be vastly larger than the sum of the yields of the two systems operated individually. The USGS has more than a century of experience working with Federal, State, local and tribal governments, developing and applying hydrologic science to the effective management of water resources. The science conducted by the USGS in this area is highly beneficial to many communities across the Nation that have been a part of these collaborations. The USGS also makes the results of these collaborative studies available through a wide variety of literature, data bases, and computer simulation models, all available freely. The USGS has summarized a number of recent studies related to conjunctive management in a report "Evolving Issues and Practices in Managing Ground-Water Resources: Case Studies on the Role of Science," USGS Circular 1247. http://pubs.usgs.gov/circ/2003/circ1247/

CONCLUSION

Conjunctive management of surface and ground water resources will increase as population growth places increasing stress on water supplies. The Federal government will continue to cooperate with states and water providers as they develop and implement these programs. This concludes my testimony.